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Pre-Service Classroom Teachers' Science Teaching Efficacy Beliefs and their Locus of Control Status

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Abstract
The aim of this study is to examine science teaching efficacy beliefs (self-efficacy and outcome expectancy) of pre-service classroom teachers according to their locus of control types. In this study which is based on descriptive research model, Science Teaching Efficacy Beliefs Instrument (STEBI) and Rotter's Internal-external Locus of Control Scale were implemented to 211 fourth year Primary Education students who have been training at Necmettin Erbakan University (N=109) and Kastamonu University (N=102) in 2011-2012 academic year. The data obtained from this study was analyzed by using descriptive statistics (percentage and frequency) and independent samples t-test with SPSS 11.5 program. According to the results it was seen that candidate classroom teachers' science teaching efficacy beliefs has grown at a high level and self efficacy beliefs stronger than outcome expectancy. When locus of control positions examined, it can be said that the sample has both internal and external locus of control types, however mean score is closer to internal locus of control interval. Furthermore, candidate classroom teachers' science teaching efficacy beliefs differ by their locus of control states.

Keywords: Science education, self-efficacy beliefs, locus of control, candidate teachers, classroom teachers.

Introduction
Self-efficacy, which emerged the first time from Bandura's Social Learning Theory, is a construct which is related to the judgments of individuals about their ability to succeed in specific situations **[**1]. People with strong sense of self-efficacy, invest more effort and persist longer than those with low self efficacy. Efficacy beliefs of individuals also affect their way of thinking, problem solving skills and emotional responses. People with low level of self efficacy beliefs perceive the tasks more difficult than they really are. They are generally narrow-minded and experience great difficulties when they face with problems [2]. Studies suggest that self efficacy is a context-specific construct. One of the most studied contexts is related to teachers' sense of self-efficacy [3, 4, 5]. Aston defines teachers' self-efficacy beliefs as their perceptions about their capacity to effect students' performance and ability to fulfill their tasks successfully. Tschannen-Moran and Woolfolk-Hoy define self efficacy of teachers as the belief about perceived ability to reach desired outcomes of learning and participation even with those students who may be difficult and unmotivated.
Concept of locus of control stemmed from "Social Learning Theory" which was developed by Rotter (1954). This theory tries to reconcile two major theoretical approaches of contemporary psychology: cognitive theory and behavioral theory. Locus of control emerges as a result of individual's generalizing of an expectation that certain reinforcement will follow a certain behavior. When the individual perceives that his own behavior results in a certain positive or negative reinforcement, he will develop an expectation that the same reinforcement will follow the same behavior in the future as well [6] Rotter claims that these expectations are generalized depending on one of the two trends. These two types of locus of control which are shaped in the development process are referred as internal locus of control and external locus of control. Individuals' belief that the events they encounter in life occur as a result of their own behavior indicates that they have internal locus of control. On the contrary, if individuals attribute the events they face in life to factors other than themselves, such as luck, chance, fate or powerful others, they have external locus of control [7].
Science teaching provides children with opportunities to observe and examine the world around them from a scientific perspective. Children develop objective thinking skills as a result of looking at events from a scientific perspective. Self efficacy beliefs of teachers are of great importance in science teaching [8]. Research suggests that classroom teachers' science teaching efficacy beliefs affect their students' achievement in science courses [9]. On the other hand, teachers with internal locus of

control, strive for improving children's ability to learn. However, teachers with external locus of control might not put any effort to improve their students' skills, since they think that their lack of skills are a fate for them and there is nothing to do to improve their abilities. In this context, teachers' locus of control types and self-efficacy beliefs are important. Therefore, this study examined science teaching efficacy beliefs of pre-service classroom teachers according to their locus of control type.

Purpose of the Study

The purpose of this study is to determine whether science teaching efficacy beliefs of pre-service primary teachers' differ by their locus of control type. In this context, the following questions will be answered:

1. What are the pre-service classroom teachers' science teaching efficacy beliefs?
2. What are the types of locus of control of pre-service classroom teachers?
3. Are there any differences between students with internal locus of control and external locus of control with regard to their self efficacy beliefs?

Method

This study, which aims to determine whether pre-service teachers self efficacy beliefs differ by their locus of control types, is a descriptive study with a general survey model. Survey models aim to describe the nature of existing conditions [10]

Sample of the Study

The sample of this study consisted of 211 pre-service classroom teachers who were studying their fourth year at Teacher Training Institutes of two universities in Turkey: Necmettin Erbakan University (N=109) and Kastamonu University (N=102) in 2012-2013 academic year.

Data Collection

To collect data, "Rotter Internal-External Locus of Control Scale" and "Science Teaching Self-Efficacy Beliefs Instrument (STEBI)" were used. Rotter's Locus of Control Scale is a 29-item forced-choice test which means that the subjects are forced to choose between two options The Locus of Control Scale was developed to determine the degree to which the individual has an internal vs. external locus of control. The scale includes six filler items, which have no relevance to locus of control, for hiding the purpose of scoring. Remaining 23 of the items are related to locus of control regarding achievement, affection, social attitudes and political perspectives (Rotter, 1966). The scores between 0-11 point range indicates internal locus of control, and scores between 12-23 point range indicates external locus of control.

The original STEBI which was developed by Enochs and Riggs [11] consists of 25 items in a five-point Likert-type scale ranging from strongly agree to strongly disagree and has two subscales: PSTE, including 13 items, and STOE, including 12 items. High scores on the first scale indicate a strong personal belief in one's own efficacy as a science teacher, and high scores on the second scale indicate high expectations of the outcomes of science teaching.

The STEBI was adapted to Turkish by Hazır-Bıkmaz [12] and it was established that the Turkish version is a valid and reliable instrument. Bıkmaz conducted a factorial analysis, which revealed that the factorial structure of the STEBI developed by Enochs and Riggs was the same as that observed for the Turkish sample. Three items were removed from instrument because of low factor loadings. Finally, the Turkish version of STEBI consists of 20 items, and the PSTE subscale includes 13 items, and STOE subscale includes 7 items. Reliability coefficients for the PSTE and STOE were calculated as .78, and .60, respectively. The results of these analyses indicate that the STEBI could be considered as a reasonable instrument to produce valid and reliable data.

Data were analyzed by using descriptive statistics, mean(X), standard deviation (s), percentage (%), and independent samples t-test. Analysis was performed by using Statistical Package for Social Sciences (SPSS) 11.5.

Results

Self efficacy beliefs of fourth year primary education students were determined by analyzing their responses to the science teaching efficacy beliefs Instrument. The results are presented in Table 1.

Table 1. Descriptive statistics on Science Teaching Efficacy Beliefs of Pre-service Primary Teachers

Dimensions	**n**	$\bar{x}$	**s**
Personal Science Teaching Efficacy Beliefs	211	3.54	.84
Outcome Expectancy	211	3.47	.76
Science Teaching Efficacy Beliefs	211	**3.52**	.73

Table 1 shows that science teaching efficacy beliefs of pre-service classroom teachers are in highly positive level (X= 3.52). When science teaching self-efficacy beliefs and outcome expectancy dimensions are examined separately, mean scores on the scales in both dimensions also indicates that candidate teachers' beliefs are highly positive.
Pre-service teachers' locus of control types were determined by examining the scores on Rotter' scale. The results are presented in Table 2.

Table 2. Descriptive Statistics on Pre-service teachers' Locus of Control

Locus of Control Type	**n**	$\bar{x}$	**%**
Internal Locus of Control	115	7.85	54.5
External Locus o Control	96	14.41	45.5
General	211	**10.87**	100

Table 2 shows that the mean score of pre-service teachers on the Rotter's scale is in the middle of external locus of control and internal locus of control (X=10.87). However, the mean score was closer to the internal locus of control interval. This can be interpreted as that the tendency is toward to internal locus of control.
Independent samples t test was performed to determine whether the self efficacy beliefs differ by locus of control type. The results are presented in Table 3.

Table 3. t-test results related to differences in science teaching efficacy beliefs according to locus of control types

	Locus of Control	**n**	$\bar{x}$	**sd**	**sd**	**t**	**p**
Self Efficacy	Internal	115	3.77	.73	209	4,571	**.00**
	External	96	3.27	.87			
Outcome Expectancy	Internal	115	3.65	.66	209	3,673	**.00**
	External	96	3.27	.83			
Science Teaching Efficacy Beliefs	Internal	115	3.73	.64	209	4,827	**.00**
	External	96	3.27	.75			

According to the results of the t-test, it was seen that science teaching efficacy beliefs of pre-service teachers vary according to their locus of control type (t (209) = 4.827, p <0.05). Results showed that pre-service teachers with internal locus of control posses higher level of positive science teaching efficacy beliefs than the pre-service teachers with internal locus of control.

Discussion and Conclusion

Results of the study showed that science teaching efficacy beliefs of pre-service teachers are generally in a highly positive level indicates that they believe that they can teach science effectively in their future classrooms. When the outcome expectancy and personal science teaching efficacy dimensions are separately examined, it was seen that their both beliefs are also in highly developed level. The results of the study suggest that pre-service classroom teachers possess positive

perceptions about their proficiency in science teaching and believe that their capabilities are sufficient for making students and the educational system successful.

Although the mean score on Rotter's locus of control scale indicates that students are closer to the internal locus of control type, this should be read in this way: there are pre-service teachers with external locus of control type and internal locus of control in the sample. The pre-service teachers with internal locus of control believe that any personal effort, decision, or choice would have a significant effect on their future. However the ones with external locus of control believe that luck, fate or other people would have a big effect in their life. The t-test results indicate that the difference in science teaching efficacy beliefs is in favor of the students with internal locus of control. In other words, pre-service teachers who attribute their success or failure to their own behavior have more positive self efficacy beliefs. These results suggest that pre-service classroom teachers with internal locus of control type have more confidence in themselves to teach science in their future classrooms. Considering that classroom teachers are the most significant role- models in primary school students, it can be said that teachers' efficacy beliefs effect students' self efficacy beliefs in learning science.

Pre-service teachers' graduating from teacher training institutes with highly positive science teaching efficacy beliefs is seen as an important factor for primary school children's achievement and self efficacy in science. In this study, the effect of locus of control on self efficacy beliefs is examined. Further studies are suggested to investigate the effect of other factors on science teaching efficacy beliefs. Qualitative research studies by interviewing with the pre-service teachers on their views about what would be done to improve their science teaching efficacy beliefs might be beneficial.

References

[1] Pajares, F. (2002). Overview of social cognitive theory and self efficacy. [Online]: http://www.des.emory.edu/mfp/eff.html

[2] Kaptan, F. & Korkmaz, H. (2002). Probleme dayalı öğrenme yaklaşımının hizmet öncesi fen öğretmenlerinin problem çözme becerileri ve öz yeterlik inanç düzeylerine etkisi. *V. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi*, ODTU Ankara.

[3] Aston, P.T. (1984). Teacher efficacy: A motivational paradigm for effective teacher education. *Journal of Teacher Education,* 35 (5), 28-32.

[4] Tschannen-Moran, M. & Woolfolk-Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education, 17* (7), 783-805.

[5] Bayraktar, Ş. (2009). Sınıf öğretmeni adaylarının fen öğretimine yönelik yeterlik inançlarının incelenmesi. *Milli Eğitim Dergisi*, 2009,(182):58-71

[6] Dağ, İ. (1991). Rotter'in iç-dış kontrol odağı ölçeğinin üniversite öğrencileri için güvenirliği ve geçerliliği*, Psikoloji Dergisi* Cilt:7, Sayı 26, Ankara.

[7] Jeloudar, S. Y. & Goodarzi, F. (2012). Predicting teachers' Locus of control and job performance among MA and BA teachers senior secondary schools. *International Journal of Humanities and Social Sciences.* 1(1).

[8] Erden, E. (2007). Sınıf öğretmenlerinin fen öğretim öz-yeterlilik inançlarının öğrencilerin fen tutumları ve akademik başarıları üzerindeki etkisi. Yayınlanmamış Yüksek Lisans Tezi. Ege Üniversitesi, İzmir.

[9] Dönmez, S. (2011). *Sınıf öğretmenlerinin fen ve teknoloji dersi öz yeterlik inançlarının denetim odağına göre farklılığının incelenmesi üzerine bir araştırma*. Yayımlanmamış yüksek lisans tezi, Afyon Kocatepe Üniversitesi, Afyon.

[10] Karasar, N. (2007). *Bilimsel araştırma yöntemi* (17. baskı). Ankara: Nobel Yayın Dağıtım.

[11] Enochs L. G. ve Riggs, I. M. (1990). "Further development of an elementary science teaching efficacy belief instrument: A pre-service elementary scale", *School science and mathematics*. 90 (8), 694-706. (ERIC Document Reproduction Service No. ED319601).

[12] Hazır-Bıkmaz, F. (2004). Sınıf öğretmenlerinin fen öğretiminde öz yeterlilik inancı ölçeğinin geçerlik ve güvenirlik çalışması. *Milli Eğitim Dergisi*, 161.